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DIEDERIKS & WHITELOW
12471 DILLINGHAM SQUARE #301
WOODBRIEDGE, VA 22192

EXAMINER

LEUNG, JENNIFER A

ART UNIT PAPER NUMBER

1764

DATE MAILED: 05/05/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/843,936

Applicant(s)

DODD ET AL.

Examiner

Jennifer A. Leung

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 February 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 31 and 35-40 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 31 and 35-40 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 April 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 19 February 2003 is: a) ☒ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

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DETAILED ACTION

Response to Amendment

1. The Amendment filed on February 19, 2003 has been received and carefully considered. The submitted changes to the Drawings are acceptable. Claims 1-30 and 32-34 are cancelled. Claims 31 and 35-40 remain active.

Drawings

2. The drawings are objected to because in FIG. 2, the reaction equilibrium,

“ $\text{CO} + \text{H}_2 \rightleftharpoons \text{CO} + \text{H}_2\text{O}$ ” should be changed to -- $\text{CO}_2 + \text{H}_2 \rightleftharpoons \text{CO} + \text{H}_2\text{O}$ --.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection will not be held in abeyance.

Claim Objections

3. Claim 40 is objected to because of the following informality: “an internal combustion engine” (line 2) should be changed to -- the internal combustion engine -- for proper reference to “an internal combustion engine” set forth in line 1. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 39 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention, because it is unclear as to the structural relationship of “a second storage unit” to the other elements of the apparatus.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 31, 35, 36, 37, 38 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eliasson et al. (DE 4 332 789 or JP 07-149670) in view of Takahashi (JP 07-315802 or U.S. 5,746,985, cited as an English Language Equivalent).

With respect to claim 31, 36 and 37, Eliasson et al. disclose a system comprising:

- An electrolyzer **3** adapted to be connected to supplies of water (FIG. 1, H₂O) and electricity **1, 2**, and operable to provide electrolysis of water to generate hydrogen (FIG. 1, H₂);
- A first reactor **4** connected to the electrolyzer **3** to receive hydrogen from the electrolyzer **3** and to react the hydrogen with carbon dioxide to form methanol (FIG. 1, CH₃OH); and
- A storage unit **7** connected to the first reactor **4** for storing of said methanol.

Eliasson et al. further disclose the stored methanol **7** may be supplied to a consumption object **8**, and lists examples of vehicles, plants, etc. (section [0015]). However, in view of the newly added limitations, Eliasson et al. are silent as to whether the consumption object **8** may comprise a second reactor connected to said storage unit **7** to receive the methanol from the storage unit **7**, to convert the methanol back into hydrogen and carbon dioxide, and whether the system may further comprise means for recycling the carbon dioxide produced in the second reactor to the

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first reactor 4.

Takahashi (FIG. 1; column 3, line 61 to column 4, line 25) teaches a "second reactor" in the form of a reforming reactor 11 (FIG. 1), wherein supplies of fuel, water, and oxygen are fed to reactor 11 and subjected to a reforming reaction to generate mainly hydrogen and carbon dioxide. As disclosed by Takahashi, the fuel may comprise conventionally known reforming reactants such as hydrocarbons or a hydrocarbon containing oxygen such as *methanol* (column 1, lines 8-17, 34-45). Takahashi further discloses feeding the generated hydrogen and carbon dioxide stream to a hydrogen-separating apparatus 14, wherein the purified hydrogen is separated for downstream use as an energy source for a generator, such as a fuel cell 16. The carbon dioxide and unrecoverable hydrogen are discharged.

It would have been obvious for one of ordinary skill in the art at the time the invention was made to provide the "second reactor" of Takahashi to the apparatus of Eliasson et al., on the basis of suitability for the intended use and absent showing any unexpected results thereof, because the second reactor provides a means for utilizing the generated methanol as an energy source for fueling consumption objects, such as a generator or fuel cell for vehicles, as taught by Takahashi (column 1, lines 8-17; column 3, lines 27-54). Furthermore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to provide a means for recycling the carbon dioxide generated by the "second reactor" to the first reactor in the modified apparatus of Eliasson et al., because by doing such, the carbon dioxide is not discharged into the atmosphere but conserved, thereby providing additional raw material for the generation of methanol. In addition, the amount of carbon dioxide released as waste gas is reduced, thereby minimizing the environmental problems caused by the greenhouse effect, as

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disclosed by Eliasson et al. (section [0002]).

With respect to claim 35, Eliasson et al. (FIG. 1; Section [0013]) disclose the first reactor 4 is connected to a further source of carbon dioxide 5, 6, 6a in addition to the recycling means, in the modified apparatus.

With respect to claim 38, although the "second reactor" or reformer 11 comprises "a partial oxidation" reformer (column 4, lines 13-16), it would have been an obvious design choice for one of ordinary skill in the art at the time the invention was made to select an appropriate reformer, such as a "steam reformer", for the reformer in the modified apparatus of Eliasson et al., on the basis of suitability for the intended use and absent showing any unexpected results thereof, since the use of "steam reforming" for the generation of hydrogen and carbon dioxide from hydrocarbon fuels is conventionally known in the art, as taught by Takahashi (column 1, lines 18-26).

With respect to claim 39, although Eliasson et al. are silent as to a second storage unit for storing the carbon dioxide produced in the second reactor, it would have been obvious for one of ordinary skill in the art at the time the invention was made to provide a second storage unit to the modified apparatus of Eliasson et al., because providing a means for storing the carbon dioxide, which would otherwise be discharged into the atmosphere, further minimizes the environmental problems caused by the greenhouse effect, as disclosed by Eliasson et al. (section [0002]).

6. Claim 40 is rejected under 35 U.S.C. 103(a) as being unpatentable over Eliasson et al. (DE 4 332 789 or JP 07-149670) in view of Takahashi (JP 07-315802 or U.S. 5,746,985, cited as an English Language Equivalent), as applied to claim 31 above, and further in view of Degnen, Jr. et al. (U.S. 4,884,531).

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With respect to claim 40, the collective teachings of Eliasson et al. and Takahashi are silent as to whether the second reactor may be used to provide hydrogen to an internal combustion engine. In any event, it would have been an obvious design choice for one of ordinary skill in the art at the time the invention was made to provide an internal combustion engine to the modified apparatus of Eliasson et al., on the basis of suitability for the intended use and absent showing any unexpected results thereof, since the integration of "a second reactor" or reformer and an internal combustion engine is conventionally known in the art, as evidenced by Degnen, Jr. et al. In particular, Degnen, Jr. et al. teach a system wherein a reformer 6 is provided upstream of an internal combustion engine 10, such that a hydrocarbon fuel of relatively low octane number is reformed in the reformer to provide a fuel of increased octane number to the combustion chamber of an engine (Abstract; Figure; column 4, lines 8-54).

Response to Arguments filed February 19, 2003

7. Applicant's arguments (page 4, paragraphs 3 and 4) with respect to the rejection of claim 31 in view of the Yutaka et al. reference have been fully considered and are persuasive, and therefore this rejection has been withdrawn.

8. Applicant's arguments (page 5, paragraph 4 to page 7, paragraph 1) with respect to the rejection of claim 31 in view of the Eliasson et al. and Kumar et al. references have been considered but are moot in view of the new grounds of rejection, as necessitated by amendment.

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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10. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

* * *

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is 703-305-4951. The examiner can normally be reached on 8:30 am - 5:30 pm M-F, every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on 703-308-6824. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Jennifer A. Leung
May 1, 2003 JAL

Hien Tran
HIEN TRAN
PRIMARY EXAMINER